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Decentralisation aims to bring ICT services to everyone in Uganda

Rwanda develops a network of telecentres to serve rural communities

Projects in PNG will show the viability of telecoms services in rural areas

Rural ICT policy

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Editorial

A commitment to ICTs

As with other infrastructure developments – roads, towns, water and energy supply – a large-scale communications network requires detailed planning. Many ACP governments are in the process of writing new policies or reviewing existing guidelines to ensure that their country is well prepared to take advantage of the latest developments in ICTs. The major urban centres in most ACP countries are already connected to internet and cell phone networks, usually provided by private companies, but these often do not extend beyond the larger towns and cities. Governments, therefore, have to incorporate carefully considered strategies into their national ICT policies to make sure that communication services are also delivered to the people living in rural areas.

A clear and detailed ICT policy recognises the importance of technology for further socio-economic development

In Uganda, the government has given responsibility for implementing the country's ICT policy to the district authorities. By devolving these powers away from central government, the idea is that people living in the districts could have more influence on the types of services in their area since they are closer to the locally elected officials.

District authorities, in cooperation with the country's Rural Communications Development Fund, involve private companies, community and non-governmental organisations, and local entrepreneurs in the development of the internet networks, telecentres and school ICT services. The Women of Uganda Network (WOUGNET) is one of the NGOs involved in preparing and providing training courses and organising projects to increase women's involvement in technology initiatives, particularly those in rural areas.

Future promise

The Rwandan government too has committed itself to delivering communications services throughout the country by 2020. As part of its move from an agriculture-dependent economy to one based more on technology and knowledge services, the government has initiated a plan to develop a network of telecentres reaching into rural areas.

To reach its goal of establishing a telecentre in every village, the government has commissioned the Rwandan Telecentre Network (RTN) to help with the process. So far, 12 local centres are operational, with a promise of 1,000 by the end of 2015. Each centre is equipped with computers, internet access, telephones and other ICTs to help businesses connect with potential partners and allow students and schoolchildren to develop their ICT skills. Another important function of the telecentres will be to deliver agricultural information to farmers to ensure they continue to produce enough to maintain the country's food security.

A similarly ambitious project in Papua New Guinea will improve telecommunications services in rural and low-income areas. The project is a result of a government policy developed in conjunction with the World Bank, who also have a major role in realising the objectives as set out in the original framework document.

In Africa, the United Nations African Information Society Initiative (AISI) works with government departments to develop national information and communications infrastructure (NICI) documents. AISI initially helps governments to assess the current status of their country's technology networks, and then consider the best strategies for delivering ICTs to as many people as possible.

It is not the aim of any nation's ICT policy to simply expand their communications network. Instead, it is a recognition of how important technology is for the socio-economic development of a country. And while the simple fact of having a policy does not guarantee the delivery of ICTs to rural areas, the presence of a detailed plan with clear goals certainly aids progress. The adoption of a sound rural ICT policy sends a clear message, and shows a government's commitment to developing their technology infrastructure in an equitable way. ◄

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The great task ahead

Rural ICT policy

It is widely accepted today that ICTs drive economic growth and social development. How much ICTs will benefit people in ACP countries, especially the rural majority, will largely depend on the policies and strategies that governments put in place to promote the planned and orderly deployment of communications technologies.

The introduction of ICTs into Africa, especially, is like building a pyramid from the top. Products and services are first introduced into the urban centres and later spread into peri-urban, and eventually into rural areas. The ICT development challenge for Africa is how quickly we can spread planned and coordinated ICT services to the bottom of the pyramid – the rural areas – where the majority live, and where the hope for the greatest impact lies.

A cross-border communications network, jointly owned by African companies, will reduce Africa's over-reliance on foreign-owned satellites

GRAEME WILLIAMS/ AFRICA MEDIA ONLINE / HH

A broad partnership involving companies, organisations, educational institutes and government departments provides the support necessary to develop large-scale communications networks.

The New Partnership for Africa's Development (NEPAD) e-Africa Programme is now facing the huge task of tackling the bottom of the pyramid. This task is too important, too urgent and too big to be left to governments. The public and private sectors have to work with non-governmental organisations and development partners to realise the promise of ICT.

The NEPAD e-Africa Programme is responsible for developing policies, strategies and programmes at the continental level. We see ICTs as standing on three pillars: secure broadband infrastructure reaching all parts of the continent, e-skills among the general populace, and e-applications and e-services. The three pillars are addressed in three major programme areas.

The AU-NEPAD ICT Broadband Infrastructure Programme aims to connect African countries to each other by a broadband terrestrial network, which is connected to the rest of the world by submarine cables. Such a cross-border network, jointly owned by African public and private companies, will reduce Africa's over-reliance on foreign-owned satellites. The attendant high transit charges are payable only in scarce foreign currencies, and result in an excessive loss of capital from the continent. The infrastructure programme has created an environment in which a continental cross-border network can be owned, developed, operated and maintained.

Crucial connections

The e-skills component is centred around the AU-NEPAD e-Schools Initiative, which targets African youth and aims to harness ICT technology to improve the quality of teaching and learning in African schools. Young Africans graduating from such ICT-enabled schools will have the skills to participate in the global information society and knowledge economy. The programme started with a demonstration phase that had several components running in parallel: teacher training, content development, satellite connectivity, pilot implementation and development of a business plan on which to base the expansion of the programme.

The private sector played an important role by providing, deploying and operating ICT-based education and health projects in the nearly 100 mainly rural schools in 16 countries. The NEPAD e-Schools Business Plan, funded by the South African government, was built on the lessons learned in the demo phase, and provided valuable information on actions, including funding, that are required to ensure the success of e-Schools on a large scale.

The AU-NEPAD e-Applications Programme supports the structured and coordinated development and deployment of e-applications and e-services in government, health, tourism, banking and agriculture. There are special programmes in the areas of internet governance and cyber security, and community informatics.

It is the e-government programme in particular that will strengthen good governance practices in Africa by promoting the use of technology at the national, provincial, local and municipal levels. The programme will create platforms to promote the provision of efficient, transparent, equitable, streamlined, consistent and easier access to services by African citizens.

The AU-NEPAD Community Informatics Programme links all those working with ICTs for development in grassroots communities in Africa. These include NGOs, private sector suppliers, universities, researchers and government officials. The network will be a practical and on-going extension of NEPAD's work in ICT development, where a multi-sectoral approach can support individual ICT-enabled developments at the local level.

The network will provide the space for discussion, collaboration and research among the various participants on issues pertaining to ICT development in Africa. This programme is expected to enhance policy development, collaborative research partnerships and initiatives in ICT4D.

By providing support at each of these levels, NEPAD and our partners intend to develop skills and infrastructure that will bring technology to all parts of the continent. Africa has an opportunity to learn from experiences of other regions, such as India, where ICT has arrived at the bottom of the pyramid and is now transforming the lives of the rural poor. ◄

Democracy of technology

Uganda's decentralisation policy has led to the development of wireless broadband services in all of the country's districts. Cooperation between the government, NGOs, businesses and individuals will be essential to give everyone equal access to ICTs.

National ICT policies provide guidance on how a country promotes the development of the information and communications sector. Ideally, these policies ensure that everyone in the country benefits from a strong and competitive ICT sector. In practice, however, implementation can be slow. Some areas end up being better served than others, resulting in the so-called 'digital divide', as seen in many ACP countries today.

Unfortunately, it is often rural areas that are left without access to communications technology. In Uganda, where 80% of the population lives in rural areas and is dependent on agriculture, policy makers decided to address the specific problems of disproportionate access in a number of policy documents. The country developed a separate Rural Communications Development Policy (RCDP), and made special provisions for remote communities in its national ICT policy. And, in 1997, the Communications Act gave the Uganda Communications Commission the mandate to establish a Rural Communications Development Fund (RCDF) to ensure delivery of ICTs to underserved communities.

RCDF works closely with individual districts, and their lower administrative units, who provide support for the implementation and monitoring of the RCDP. Local authorities play an important role in Ugandan administration since the devolution of power was adopted into the country's 1995 constitution. The rationale behind decentralisation was that local and community governments could provide more efficient services if they were given the responsibility for finance, legislation, planning and human resource management in their area. After all, local governments should be able to monitor the delivery of services better than a distant central authority. Also, since local politicians are directly elected by people in their community, local citizens have more direct involvement in how they are governed.

Customer Service

Evidence of the effectiveness of decentralisation remains inconclusive, however. For instance, more work still needs to be done to improve access to agricultural extension and advisory services. District authorities often find it difficult to budget for the all the operational expenses involved in such activities, but they also lack feedback from farmers who often do not have the capacity to articulate their demands.

In general though, decentralisation has made it easier to implement the RCDP, with discernible results. All district towns (existing before 2008) are now covered by a wireless broadband network, and all districts have at least one secondary school with the required ICT infrastructure to meet the needs of the country's secondary school curriculum. Initially, the RCDP implementation strategy focused on developing services in places where they are likely to be sustainable, typically at the district headquarters, while making provision for the promotion of ICT awareness to the outlying areas in preparation for any future expansion.

Although the districts are responsible for the implementation of ICT policy in their area, it is more usually the private sector – telecommunications, postal, information technology and broadcasting companies – that carries out the work. Uganda's ICT policy promotes private sector-led development, so businesses are involved in many of the country's communication projects. These include the National Backbone Initiative, RCDF and the Rural Electrification Programme, which also has components for improving ICT infrastructure.

As the new networks have expanded, many companies have developed related services for their customers. Farmers, in particular, are proving to be an increasingly important consumer group. The country now has a number of SMS-based market and agricultural information services to help producers find the best prices for their crops and develop links with related industries.

Universal

The overall objective of Uganda's ICT policies, and of the current RCDF in particular, is to ensure that the new communication services support the country's development goals. This means not only introducing technology to all parts of the country, but to make sure that every citizen, whether male or female, has equal access.

Gender is widely recognised as a critical factor in determining who uses ICTs, and it will be a major challenge to successfully implement equitable policies in an environment where females are still using ICTs far less than males. To address this, Uganda's ICT policies stress the need to address the issue of women's access to technology. The National ICT Policy, for example, has 14 objectives, one of which specifically ensures that gender is included in the country's information and communication programmes.

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SHEHZAD NOORANI / LINEAR

Affordable cell phone services have led to the development of several SMS-based market information and agricultural advisory systems.

The strategies take into account the information needs and interests of both men and women, and they develop mechanisms for increasing women's access to information, especially in rural areas. Another important aspect of introducing gender awareness into new policies is that they attempt to use non-discriminative language, and ultimately aim to ensure equal participation in all aspects of ICT development.

As part of their strategy to involve as many parts of society as possible, the government has involved local NGOs to help them achieve universal access. One such organisation, the Women of Uganda Network (WOUGNET) has been working since 2000 to raise awareness of the benefits of ICTs for development. Initially set up to strengthen the use of technology among women and women's organisations, the NGO also advocates for gender sensitive ICT policies to ensure that males and females in Uganda have the same opportunities to benefit from ICTs.

Aware that affordable and equitable access to information remains a particular challenge in rural areas, WOUGNET's advocacy programme addresses two key areas: influencing gender and ICT policy processes, and documenting projects, activities and experiences (the latter is done using the gender evaluation methodology (GEM) developed by the Association for Progressive Communications). This has led to the publication of briefing papers and articles in a variety of areas, including e-agriculture, mobile activism and the use of ICTs in preventing violence against women and girls.

The organisation carries out much of its advocacy work in its role as secretariat of the Uganda Women's Caucus on ICT (UWCI), a coalition of organisations and individuals interested in gender and ICT issues. As well as strengthening the skills of other gender activists, UCWI highlights the main issues during meetings with policy makers, and promotes the need to integrate ICTs into more general gender policies.

One success of note was the development of the Girl Child Project that came from discussions between UCWI and the Uganda Communications Commission. The project builds the ICT skills of young males and females, and encourages them, as consumers, to request and demand improvements to their local technology services. By stimulating demand, people will make more use the new infrastructure, which is necessary to maintain the efficient and effective development of the country's communications sector.

The awareness raising works both ways, however, as WOUGNET also helps policy makers, media professionals and ICT experts understand and articulate gender issues in their work. This expertise puts the organisation in an ideal position to assess the implementation of ICT policies, and has surveyed the gender aspects of the country's Rural Communications Development Fund.

Since gender is a critical factor in determining who uses ICTs, Uganda's ICT policies stress the need to address the issue of women's access to technology

Regular review

A major strength of WOUGNET's approach is in the practical use of ICT tools throughout its advocacy work. As part of the global campaign, Take Back the Tech, the organisation arranged a local action encouraging Ugandans to use SMS to speak out on violence against women. The activities helped to develop

Related links

Ugandan Ministry of Information and Communications Technology
Established in 2006, the MoICT coordinates the policy, laws and regulation for the information and communications sector in Uganda.
➜ **www.ict.go.ug**

Uganda Communications Commission
The UCC was set up in 1997 after the liberalisation of the communications industry in Uganda. The UCC oversees licensing, regulation and infrastructure development.
➜ **www.ucc.co.ug**

Gender Evaluation Methodology
GEM outlines methodologies and resources for evaluating whether ICT initiatives lead to an improvement in women's lives, and in broader gender relations in society.
➜ **www.apcwomen.org/gem**

FIT-Uganda market information service
FIT-Uganda provides agricultural market information on the web and via SMS.
➜ **www.infotradeuganda.com**

CELAC agricultural advisory services
The Collecting and Exchanging of Local Agriculture Content project sends monthly SMS messages with agricultural advice to farmers, in the English, Luganda and Luo languages.
➜ **http://goo.gl/bZKdO**


SHEHZAD NOORANI / MAJORITY WORLD / LINEAIR

Uganda decentralisation

According to the country's 1997 Local Government Act, the devolution of powers, functions and responsibilities to local governments would:

- 'transfer real power to the districts, thereby reducing the workload of the remote and under-resourced central government officials;
- bring political and administrative control over services to the point that they can actually be delivered, thereby improving accountability and effectiveness and promoting people's ownership of programs and projects executed in their districts;
- free local managers from central government constraints and, as a long-term goal, allow them to develop organizational structures tailored to local circumstances;
- improve financial accountability and responsibility by establishing a clear link between payment of taxes and provision of services they finance; and
- improve the capacity of local councils to plan, finance, and manage the delivery of services to their constituents.'

strategies aimed at ending violence against women and girls, paying particular attention to ICT policies and interventions. This, and many other gender-related issues, are promoted through the organisation's website, social networking tools and mainstream media. For example, the national television channel broadcast a news item about a national strategy workshop, and showed how activists are using ICTs to fight violence against women.

ICTs play an important role in another project, Enhancing Income Growth between Small and Micro Women Entrepreneurs in Uganda, which works with 150 female entrepreneurs in the Apac, Ibanda and Mukono districts. WOUGNET is also the national partner for the Strengthening Women's Strategic use of Information and Communication Technologies to Combat Violence against Women and Girls regional project. This initiative is aimed at helping women participants feel more comfortable with using technology, and demonstrating the opportunities it can offer, such as increased freedom, while also addressing concerns about privacy and security.

Through this work, people living in rural areas develop the skills to use ICTs to present their opinions on matters that interest them. In a good governance project, for example, local authorities can publish information on budgets and expected activities. People in the community can monitor these activities, and use SMS or voice calls to provide feedback and report issues of concern.

WOUGNET encourages this kind of local involvement and promotes it through various online and print publications. The organisation also gathers SMS messages, as in the case of the 16 Days of Activism against Gender-based Violence campaign, and collects them into reports that are then submitted to policy makers. With this information, along with details gathered from other sources and research projects, the ministries can continue to monitor and identify gender and equity gaps in ICT use, and adapt their policies accordingly.

It can be difficult, however, for people to see change as a result of their country's policies, but in Uganda the benefits are already obvious. A competitive telecommunications sector means relatively low-cost cell phones are widely available, while the cost of calling and sending SMSes is affordable for many people. All that remains is to make sure that all these services and opportunities afforded by the technology are available to everyone, regardless of where they live, male or female. ◄

A network for a new economy

Rwanda's investment in technology is not restricted to the country's urban areas. Rural communities benefit too through the development of a telecentre network.

Rural ICT policy

The Government of Rwanda's document, 'Vision 2020', sets out plans that will transform the country's economy from being largely dependent on agriculture to concentrating on providing knowledge and information services. The processes involved in this transformation are outlined in four national information and communication infrastructure (NICI) plans. Each plan covers a specific five-year period between 2000 and 2020, during which time the government hopes that Rwanda will have reached middle-income status.

The first NICI strategy from 2001–2005 set out to create conditions within the country that would favour a technology-based economy. The second plan enabled the development of the necessary infrastructure. This plan, NICI II, concluded at the end of 2010, and the country is currently in the process of implementing NICI III. This will shift the focus to the provision of technology-related service industries. A central goal for the 2011–2015 plan is to engage Rwanda's population in the process, prepare them for the shift in the economic environment, and involve them in the creation of new jobs and businesses.

The development of information services in rural areas is crucial to Rwanda's national ICT policy.

ISSOUF SANOGO / ANP

A significant component of the national strategy is its focus on developing skills and building opportunities in rural areas through the establishment of local ICT centres, also known as telecentres. Here, people can use computers, access the internet and other digital technologies to gather information, create, learn, and communicate. So far, twelve centres and two mobile ICT buses are in operation and another eighteen centres will soon be open. But because the goal is to have a telecentre in every Rwandan village, the current speed of deployment is too slow.

In an effort to increase the rate of telecentre development, the Rwandan Telecentre Network (RTN) is supporting government efforts and has set out to create a countrywide network of 1.000 ICT centres by the end of 2015. The project also includes training local staff to work in the centres. These trained personnel will help their communities develop digital content such as websites and blogs as a means of sharing information and experiences with others throughout the country. RTNs work is in line with the requirements of the national ICT plan in that it promotes the innovative use of technology for development, and generates employment opportunities in rural areas. Both of these aspects tie in with the aims of the overall NICI strategy, which is to raise awareness of the benefits of a technology-based economy and to reduce the number of people migrating from rural to urban areas.

Encouraging discussion

One of the consequences of the new strategy is that agricultural production could diminish as more emphasis is placed on the technology sector. Rwanda could then run the risk of causing food supply shortages in the future, or of becoming reliant on importing basic provisions. To prevent such problems, the government has introduced a number of projects that will use ICTs to support farmers. Farmers will be able to use an e-market service, E-Soko, on their cell phones and on the web to access up-to-date market data, while most the information activities will be coordinated by a central agricultural information centre.

The new telecentres will play an essential part in developing rural communications systems too. Their job will be to ensure that farmers get the information they need to maintain sufficiently high levels of production. Staff at the centres will train farmers to use the technology to share advice and ideas with other farmers throughout the telecentre network. Mobile ICT centres will the service areas where there are no telecentres.

So far, the Rwandan Telecentre Network coordinates 150 telecentres in the country, 90% of which are located in semi-urban and rural areas. Local entrepreneurs operate the centres, which have between five and twenty computers and other equipment such as scanners, printers, televisions, CD ROMs and video players.

There is, however, a lack of relevant content that would be interesting to people living in rural communities. Most of the current users, therefore, are students researching academic topics and business people seeking to establish contact with other companies or promoting their products and services.

In the meantime, RTN makes its own contribution to the production of local content by publishing articles on ICT for development issues and providing information on the web in English and the local language, Kinyarwanda. The organisation also stimulates debate by organising radio programmes and discussions, and plays a critical role in the national team working on the implementation of NICI III.

Rwandans are already used to using traditional media, such as newspapers and radio to debate national issues. And, as the network of telecentres expands and people develop their skills using the new technology, rural communities will have a greater opportunity to communicate their concerns and help to shape future government policy. ◄

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HEINER HEINE / IMAGEBROKER / LINEAIR

The benefits of better services

The government of Papua New Guinea has introduced a Universal Access Scheme to fund the development of telecommunications services in rural parts of the country.

Rural ICT policy

Access to telecommunication services can greatly improve economic growth. And this is especially the case in developing countries. According to the World Bank, an increase of 10% in mobile phone penetration results in a 0.8% increase in economic growth. And there are many potential benefits to a whole range of beneficiaries.

For instance, access to improved communications services reduces costs for small and medium-sized business because it becomes easier to conduct domestic and cross-border transactions. New services also open up new marketing and distribution channels and improve access to information about markets, prices and consumers. Farmers, many of whom live in remote rural areas can now gain access to similar information related to their particular business, along with updates on weather, agricultural extension services and electronic trading platforms.

The expansion of cell phone and internet banking services opens up new possibilities for service industries such as tourism too. And rural communities benefit from reduced travel time and cost savings because they have better access to health information, education services and job opportunities. They can also maintain closer contacts with distant family members and can send and receive money over large distances using secure methods. Women are often the greatest beneficiaries of improved communications services as female entrepreneurs take advantage of income-generating opportunities.

Better connectivity benefits government agencies too. For example, it allows them to exchange data on disease surveillance, for example, between national and sub-national offices. It also makes it easier for them to implement plans and administer budgeting issues. And in cases of disaster recovery, effective communications are vital.

Proof of concept

In Papua New Guinea (PNG), the Rural Communications Project will help to deliver these benefits through the

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The findings, interpretations and conclusions expressed in this article are those of the author and do not necessarily reflect the view of the World Bank Group, its Board of Directors or the governments they represent.

Summary of Demonstration Projects in Chimbu and East Sepik

	Chimbu	East Sepik
Total Population of Province	314,928	412,173
Number of beneficiaries from pilot projects	175,000	245,000
Number of people who will not benefit from pilot projects	3,752	71,702
Number of public access points (payphones) to be installed	310	400
Expected number of subscribers in project areas	20,000	16,500

improvement of telecommunications services in rural and low-income areas. Despite a recent expansion of the telecommunications industry, ICT penetration is still among the lowest in the world. The introduction of a more competitive sector in 2007 made cell phone services more accessible and lowered prices, but many people still lack internet access because of high prices and limited investment in the development of the necessary networks.

In 2010, the government introduced a new National Information and Communications Technology Act and established a regulatory agency, the National Information and Communications Technology Authority (NICTA). These, along with other legal and regulatory improvements, will lead to sector-wide reform and are likely to have a positive impact on investment and improve the delivery of services. The new Act formalises the introduction of the Universal Access Scheme (UAS) Fund.

The UAS Fund, which is made up of subsidies that come from a levy charged to all operators, is widely used in other countries to ensure that telecommunications services are delivered to rural areas, particularly to areas where incomes are low. Such funds were originally created in Latin America, and have since been implemented in Africa, the Middle East and East Asia.

The idea behind the funds is to bring telecommunications services to places where they would not be commercially viable because of the high cost involved in developing infrastructure and the lack of available income to recoup the costs. Without increased investment in such areas, a divide could develop between urban high-income, low-cost communities, and rural low-income, high-cost sections of the population. This would affect growth opportunities in poorly served areas, exacerbating the economic gap between the two sections of society.

UAS funds provide an efficient way to reach rural and low-income areas by requiring existing operators to tender for contracts to provide telecommunications services in these areas. The funds subsidise private sector investment and make it commercially attractive for companies to serve these areas.

First steps

When designing its UAS Fund, the government of Papua New Guinea asked the World Bank to assist them. The resulting Rural Communications Project (RCP) aims at creating the right set of skills within the national communications authority to deal with the UAS obligations and the design of future tender procedures.

The RCP has two main components. First, it will provide technical assistance to NICTA. This will help NICTA manage the implementation of telecommunications projects that are funded by the UAS and organise the eventual monitoring and evaluation processes. This technical assistance will also provide general regulatory support to NICTA, with emphasis on those issues that might affect the expansion of services to rural and low income areas.

The second component is the development of pilot projects. The RCP will finance the first three projects to be developed under the UAS to show the proposed 'least-cost' subsidy mechanism. The first two of these projects aim to increase mobile access in the provinces of Chimbu and East Sepik and install a public payphone for every 500 inhabitants. These two provinces were selected because of the potential impact development here would have, and because of their geographical diversity. It is expected that the projects will be replicated in other regions of the country.

Chimbu Province is in the highlands of Papua New Guinea. It has limited natural resources and very rugged mountainous terrain – which includes Mount Wilhelm, the highest mountain in the country. Coffee growing is the main economic activity, usually carried out by small farmers. East Sepik Province is totally different. It is a coastal region with quite a dispersed population. Economic activities include coffee and cocoa growing and, at a lower level, coconut cultivation [see table for a summary of the two projects].

These two pilot projects will provide internet access to approximately 60 district centres that currently do not have affordable telecommunications. This will give operators the opportunity to partner with local entrepreneurs to operate internet cafes, which will help to guarantee financial sustainability. By giving the public, local government and NGOs access to information – and, potentially to public services – this part of the project is expected to contribute to local economic and social development. It is also expected to support local business development.

Since it was set up in October 2010, NICTA has been quite dynamic in terms of reviewing policies and regulations. The RCP has just started, but work on the pilot projects is set to begin by the end of 2011 – providing rural communities with increased opportunities for economic growth through improved connectivity. ◀


OKA BARTA DAUD / REUTERS

Related resources

Economic Impacts of Broadband, in Information and Communications for Development, by Qiang, Christine and Carlo Rossotto. World Bank, 2009. ➜ http://siteresources.worldbank.org/EXTIC4D/Resources/IC4D_Broadband_35_50.pdf

Input through data

SEND Foundation Ghana uses open source software and portable computers to gather data on policy implementation from people living in rural communities.

Rural ICT policy

Since 2002, the SEND Foundation has been monitoring Ghana's poverty reduction strategy, and researching whether the country's poor have been benefitting from the government's policies. The NGO works mostly with farming communities in the north of the country to improve food security, through increasing access to market prices, credit facilities, warehousing and agricultural inputs. The organisation also supports community-based organisations to give rural communities more influence on agricultural and other relevant policies.

Health care is one such issue. SEND Ghana and its partner organisations, known as focus NGOs, have been assessing the national health insurance scheme (NHIS) to determine its availability in rural communities.

The Ghanaian government introduced the NHIS in 2003 to deliver quality health care 'within five years' to everyone in the country, regardless of income. Together with the focus NGOs, SEND Ghana developed questionnaires to find out how many people could access medical services through the scheme, and assessed the quality of the care given. The organisation then used the data to provide feedback to government ministries, and to advocate for changes to the policy to ensure it reached more people in rural communities.

Local community workers from partner NGOs upload data to a central computer via the cell phone network.

Citizen monitoring committees gathered the data, initially on paper forms. The process of entering that data into a central database was time-consuming and prone to mistakes as it was sometimes difficult to interpret handwritten notes. SEND Ghana needed a more efficient system that could deliver results quickly. Faster analysis of the data meant that the organisation could provide ministries with more reliable and up-to-date information.

The project team investigated several existing data collection methods, but found that none met their specific requirements. They decided to work with a local software developer to produce their own open source computer program that suited their exact needs, but which could also be easily adapted to collect data on any subject, not just on health care issues.

The new software, called Open Source Monitoring and Evaluation Tool (OSMT), is loaded onto small portable computers, also known as netbooks, which committee members can easily carry on visits to rural communities. Questionnaires are downloaded from their nearest local office and can be adapted to include multiple choice questions or longer typewritten comments. They can also be adapted to suit particular situations; the committee members enter the data as they interview people at home, for example, or in the clinics. When they get back to their district office, or arrive at a town covered by a cell phone network, they can upload the data using a GSM modem built into the netbook.

One problem the organisation experienced with other data collection software was that, at the time, many did not allow for offline work and the subsequent online upload. Offline working was an important feature of OSMT since not all of the rural areas in the 21 districts covered in the initial pilot project are covered by cell phone networks.

Increased credibility

While it is difficult to say whether their work has directly led to any change in policy, Martine Koopman, Ghana country manager at the International Institute for Communication and Development, which provided technology training to the project, explains that SEND Ghana has developed a good reputation among government departments. Their status, she says, and that of the focus NGOs, is likely to improve through the enhanced data gathering techniques.

'One of the first results that came out of their research on the NHIS,' says Koopman, 'was that more people are indeed entering the scheme, but that the number of doctors in rural areas has not increased. They showed that those doctors now have a much greater workload, which has an influence on the quality of care provided. It is not a problem that can be solved overnight, it takes a long time to train more doctors, but at least there is now concrete evidence to help the ministries adapt their policies.'

The government also benefits from the organisation's data as it can present the results to funding agencies and investors when looking for financial support. But, says Koopman, the project will also have an impact on local policy development. 'The data is currently uploaded to a central database at SEND Ghana's main office, but they are now working to make sure the district offices can get the information related to their specific area. This would give the focus NGOs the information they need to influence local government strategies.'

SEND Ghana make their reports available online for anyone to download and read. 'NGOs can provide accurate and independent data that people can trust,' adds Koopman. 'Gathering information directly from those who use the services, and then making it public, encourages discussion, and gives people the chance to influence decision making.' ◄

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Strategic online communication

Online communication services can help agricultural researchers, organisations and individuals working in rural development to reach a wider audience. A communication strategy embracing proven and relevant web 2.0 tools could effectively bring the evidence that researchers and activists gather to the attention of policy makers and eventually influence policy debates.

Rural ICT policy

The recent publication, Impact 2.0: Collaborative technologies connecting research and policy, provides details on how to use web 2.0 interactive services and applications for communicating issues related to policy development. The guide gives advice on the most appropriate web 2.0 services to use for each communication campaign.

Impact 2.0 describes how to use web applications and social networking sites to stay up to date with recent policy developments in the field of your interest, by providing examples of how to contact and receive updates from policy makers and identify key issues. The guide also gives detailed information on how to use web 2.0 tools to create online discussions, find others working in the same field, gather evidence for reports and promote research findings.

Using Impact 2.0

To download the guide as a PDF go to: http://goo.gl/0eU6l

However, the online wiki – or iGuide – makes it easier to explore the contents and features in the form of an interactive visualisation of the guide.

http://goo.gl/9l5hs

The iGuide shows a selection of online services mapped to each step of a communication strategy. It prescribes the suitable combination of web tools to communicate and link research findings to the broader public and to policy makers.

From the main iGuide page, click the link in the contents section to go to the iGuide Visual section and click on the diagram. The next page then shows a flash-based visual interpretation of the guide.

At the centre of the diagram is the root of the guide showing three boxes: 'Political context', 'Evidence' and 'Links'.

If, for example, an organisation wants to know more about the current political situation in its field of work, the guide offers several strategies. Clicking the box 'getting to know policy makers, their agendas and constraints' provides practical advice such as 'following online spaces where secretariats publish information about policy makers' agendas'. It suggests using the Twitter, RSS feeds, online calendars and alert services to keep up to date with the latest publications and events.

An organisation looking to develop links and 'build coalitions with like-minded stakeholders', meanwhile, could try using social networking sites, such as Ning, or organise and participate in web seminars.

Gathering data and other evidence is an important aim for many NGOs too, and here the guide offers advice on areas such as how to 'establish credibility', 'provide practical solutions' and 'establish legitimacy'. It suggests the online video applications Vimeo, blip.tv and YouTube for presenting the results of research, while pipl.com and social bookmarking tools, including Diigo and Delicious, are useful for interacting with other researchers in the same sector.

Users are encouraged to check the latest version of the tools featured since web 2.0 tools are known to evolve rapidly. ◀

Source: Impact 2.0: Collaborative technologies connecting research and policy, by Cheekay Cinco and Karel Novotný, Association for Progressive Communications (www.apc.org), with contributions from Bruce Girard, Fundación Comunica (www.comunica.org).

PETER TREANOR / ALAMY

The Impact 2.0 guide gives examples of how to use web-based applications to promote, discuss and follow policy issues.

Web 2.0 tools for policy development

Information
Learn more about the latest developments in a particular field using web 2.0 tools:
- RSS feeds
- Twitter
- Netvibes
- uberVU
- Gapminder.org
- Google Alerts

Collaboration
Develop a support network by connecting with similar organisations and researchers:
- Pipl.com
- Delicious.com
- Google Groups
- orkut.com
- CiviCRM.org
- Mindomo.com

Promotion
Boost your organisation's profile by presenting research findings to a larger audience:
- Gliffy.com
- Blogs
- Flickr
- Vimeo
- Facebook
- xtimeline.com

Resources

Documents

Up-scaling pro-poor ICT policy and practices

Rural ICT policy

Policies that are proven to be effective in reducing poverty in the small-scale projects can be expanded to reach more people using ICTs, say the authors of this report. The paper outlines lessons learned and draws comparisons from studies of ICT projects in sub-Saharan Africa and low-income Asian countries. The main factors contributing to an environment in which ICTs can be effective, according to authors, include respect for freedom of expression, competition in providing infrastructure and the promotion of locally available technology.
➜ **http://goo.gl/HCd2E**

Gender Assessment of ICT Access and Usage in Africa
The Research ICT Africa network supports, monitors and reviews ICT policy throughout the continent. As part of their Household and Individual Access and Usage Survey, this paper provides an overview of how ICTs are used and accessed by women and men in 17 countries in Africa. The study concludes that technology alone will not solve the inequalities. Instead, the authors suggest improvements to education policies and increasing mathematics, science and engineering opportunities for women.
➜ **http://goo.gl/zhSBQ**

Village voice, towards inclusive information technologies
While the use of cell phones and internet is increasingly rapidly in many developing nations, the authors of this report point out that this growth and the contribution of ICTs to poverty reduction will only continue if governments, international institutions and agencies take certain social factors into consideration. This includes developing policies and methodologies that make use of the ways in which people already share knowledge, and adapt to new technologies.
➜ **http://goo.gl/1sw0l**

Web resources

PG Exchange is a website of resources related to participatory government
PG Exchange is a database of resources on participatory governance. The site contains information on methodologies used to increase citizen participation in local and national government policy development. The site has details on how to improve electoral accountability, public dialogue and the availability of information. PG Exchange also has an active online community where people working in participatory governance around the world can share ideas and resources.
➜ **www.pgexchange.org**

ICT indicators database
DIRSI, a network of organisations and professionals working in the ICT policy sector, has developed an online database of 'Indicators of Affordability and Access to ICT in Latin America and the Caribbean. Users can choose from 13 indicators related to prices and costs of the cell phone markets in 18 countries, including the Dominican Republic, Jamaica and Guyana. The site organises the data into bar graphs, on specially generated maps or for download as a spreadsheet. Data on broadband internet costs will be added soon.
➜ **http://dirsi.net**

Academy of ICT Essentials for Government Leaders

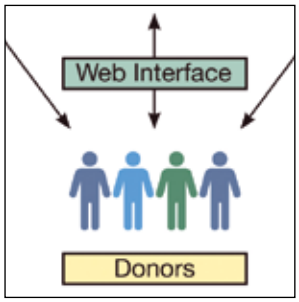
United Nations ESCAP
UN APCICT

The United Nations Asian and Pacific Training Centre for Information and Communication Technology for Development has designed a series of training modules to give policy makers and government officials a better understanding of how ICTs can be used to reduce poverty, increase educational opportunities and promote sustainable economic development. The Academy offers modules on subjects including the use of e-government applications and the theories and practices involved in the management of ICT projects.
➜ **http://goo.gl/ALe72**

Projects

CivicTEC
CivicTEC uses technology to link communities, civil society groups, government officials, NGOs and international institutions through common interests. The organisation's e-government without borders project, for example, produces online advisory documents and is currently developing an international network of professionals promoting the use of technology in small administrative initiatives. CivicTEC also supports volunteer teams using online media to report on conferences and regional events to keep a broader public informed of decision-making processes.
➜ **www.civictec.org**

Twaweza



The organisation Twaweza – Swahili for 'we can make it happen – has been working since 2009 to give people increased opportunities to access reliable information quickly, cheaply. The aim is to involve citizens in Kenya, Tanzania, and Uganda in discussions and to monitor aspects of government that affect their lives. In particular, the organisation's ten-year plan hopes to improve people's access quality education, basic health care and clean drinking water. Its Uwazi project uses cell phones, online mapping and other ICTs to gather data for partners, parliamentarians and journalists.
➜ **www.twaweza.org**

Aid Management Program
Development Gateway's aid management program is a web-based application that enables governments to better manage and coordinate development assistance. Designed for use by governments and their development partners, AMP improves the processes for planning, monitoring, coordinating, and reporting on international aid activities. The application also strengthens the transparency of the aid management process.
➜ **http://goo.gl/fMQdl**

Partners in policy development

Makane Faye (MFaye@uneca.org) is officer-in-charge of the E-Applications Section at the ICT and Science and Technology Division of the United Nations Economic Commission for Africa (www.uneca.org/aisi)

Rural ICT policy

What is AISI, and what are its main tasks?
➜ The African Information Society Initiative (AISI) was established in 1996. Around that time, there was a wave of interest internationally in using technology to develop worldwide communications networks. US vice-president, Al Gore, had just delivered his speech on global information infrastructure, and the European Union was working on its own policy on the information society. At the First African Regional Conference on Science and Technology, held in Addis Ababa in 1995, African ministers, experts and scientists drew up a plan to develop information services on the continent. AISI was given the task of assisting the implementation of this plan at country and sub-regional levels.

At the country level, this means helping governments to develop national information and communications infrastructure (NICI) plans. NICIs outline the steps a country needs to take and the goals it must have in order to meet the standards and develop the systems necessary for delivering effective information services.

Does each country need its own set of goals and steps in a NICI or is there a standard outline that every nation must follow?
➜ AISI provides some basic guidelines that should be followed, set out in 17 steps. They are not obligatory, but if they are considered in the policy development process, they can lead to an effective strategy. Of course, each country has its own variations depending on national needs, the level of political support and the local economy.

Governments do not have to involve AISI in the process of developing their NICI. We get involved only when expressly invited to assist. On our first visit to a country, we work with government departments to conduct a baseline study to assess the country's specific requirements, identify the existing networks, companies and related organisations, and set up a national NICI committee who can oversee the project. After that, we can work with all those involved to develop the policy framework. It is this framework that will become the policy document that spells out the government's priorities, defines the stages of infrastructure and sets out clear goals.

How does AISI assist in implementing policy?
➜ Some countries choose to develop their communications services for just one sector initially. They might develop a network to support health care, for example, or education. A more comprehensive strategy, such as that developed by Rwanda, which involves all sectors, takes a lot of time and resources. Whatever they decide, AISI can suggest some systems and applications that will help them put their policy into practice.

In Ethiopia, for instance, we assisted in the development of an application to help bring health services to rural areas around the town of Butajira. Medical staff there now collect epidemiological data using cell phones and computers. They share this information with researchers at the University of Addis Ababa via the internet. The original pilot project is now being expanded to more areas.

Communications technology has undergone dramatic changes in the last two decades. How can governments make sure their policies will still be relevant in 20 years time?
➜ The policies do not necessarily outline which specific technologies should be used. Instead, they set out a plan in stages, and the details are only decided at the start of each new stage. At that point, those in charge of implementing the policy can look back at what has already been achieved and make the most appropriate decisions based on all the information available at the time. The technology can, and will change, but the policy remains on track.

This is true even when the government changes. That is why so many people have to be involved in developing the NICI strategy right from the start. The other partners in the process – the private sector, community groups, NGOs, universities, and even civil servants – will continue their work even if a new government is elected.

What are the main challenges of implementing an ICT policy in rural areas?
➜ There are several issues. The first is political will. If a government does not want to commit to a policy of technological development, then it simply won't happen. Lack of electricity can be another problem, but I have seen so many innovative ways of delivering electricity to rural areas that I remain hopeful that this will not be a major constraint in the near future. Sometimes it takes a bit of imagination and creativity to overcome the obstacles, and many rural communities are helping themselves by organising committees and cooperatives to develop services in their area.

A thorough baseline study at the start of any policy development process is essential for identifying potential problems. The NICI should look ahead and provide the necessary solutions. But it is also important that any technology-based policy ties in with a country's other policies on poverty alleviation, for example, with its larger socio-economic development plans and targets to meet the Millennium Development Goals. ICTs can help a country achieve those goals – as long as there is committed participation from all the partners and sectors of society, including rural communities. ◀


KATE HOLT / EYEVINE / HH

Rural communities have to be part of a broad partnership of people involved in developing information and communications policies.


ANTONY NJUGUNA / REUTERS

A long way to go for ICTs

Countries in sub-Saharan Africa are poorly prepared to take advantage of information and communications technology. The recent Global Information Technology Report (GITR), prepared by the World Economic Forum, provides a Networked Readiness Index (NRI). The NRI lists countries according to the development of several factors, including ICT infrastructure, regulations affecting the industry, actual and potential use by governments and people. While many other regions have progressed rapidly in recent years, particularly in Europe and Asia, the report states that 'sub-Saharan Africa's networked readiness continues to be disappointing, with the majority of the region lagging in the bottom half of the NRI rankings'. Only Mauritius and South Africa make it into the top 100, at 45th and 61st positions respectively.

The GITR makes special mention of the opportunities offered by cell phones, however, saying that, 'the mobile phone has become the Trojan horse for change in the emerging world: it is inexpensive, personal, connected, and ubiquitous'. The chapter entitled The Emerging World's Five Most Crucial Words: 'To Move Money, Press Pound' details the expansion of M-Pesa in Kenya and the introduction of Tcho Tcho Mobile in Haiti. It is not the lack of funds, say the authors, that causes problems for people in developing nations. Rather, it is the inability to move money safely and quickly from buyer to seller. Mobile banking solves this problem by delivering money to the correct destination, even if sent over large distances.

➜ View the full document online: http://goo.gl/hEGnk

Competition drives expansion

Increased competition in the telecommunications sector has led to lower prices for cell phone users in many African countries. The 2011Mobile Africa Report, Regional Hubs of Excellence and Innovation, explains that many cell phone network operators are now providing internet services to make up for the loss in revenue from voice calls. According to the report, internet service providers are increasingly expanding into rural areas to compete with mobile operators for a greater share of the available market. The author, Dr Madanmohan Rao, research project director for MobileMonday, also notes that most people in sub-Saharan Africa will access the internet via a cell phone rather than a laptop in the near future. Greater access will also give a greater opportunity to create content, desperately important since only 0.2% of web pages come from African.

➜ Download the full report from http://goo.gl/mjlsd (PDF file)

Development data apps

The World Bank generates a great amount of data through its many research and evaluation projects. The World Development Indicators catalogue, for example, is published three times a year and compiles development data from around the world with a digital archive going back to 2005. Similarly, the African Development Indicators began in 1960 and gathers data on infrastructure, governance and natural resources from 53 African countries. As part of its Open Data project, the Bank challenged technology developers to come up with new ways to present these figures and make them more accessible. The Apps for Development competition offered developers the opportunity to create a software application for computers, cell phones or any other widely available platform. The first-prize winner, announced recently by World Bank vice-president, Sanjay Pradhan, was StatPlanet. The web and desktop application presents the data, including more than 30 agriculture and rural development indicators, as clear, easy-to-read graphics. The second-prize winner, Development Timelines, plots development data in a graph along with the major historical events affecting the selected country. It can show, for example, how a country's income was affected by the onset of civil war. Meanwhile, Yourtopia.net, the third-prize winner, follows a quiz format that attempts to find the countries where the development indicators already come close to your personal ideals.

➜ For more see: http://goo.gl/UYJSd

New cable offers more options

The West Africa Cable System (WACS) continues to make good progress in the delivery of broadband internet to the African continent. The cable arrived at its final destination in Yzerfontein, north of Cape Town, after making connections with ten other African nations along the west coast. The next step is to build the cable stations that will act as access points, or gateways, to bring fast internet to homes and businesses. South Africa already has two such gateways on its east coast, near the border with Mozambique. 'The third gateway is quite critical,' said, Johan Meyer, the executive for global capacity at the South African telecommunications company, Telkom. 'The other two gateways have three cables each that are in very close proximity to each other. The risk is that if a ship drags its anchor, it can cut through all three so if one gateway is affected, at least now there are two others. WACS is even more critical, because it has bigger capacity than all the others.'

Small grants give a big boost

In 2009, the Gender, Agriculture and Rural Development in the Information Society (GenARDIS) programme awarded grants of €7000 to 15 organisations to develop ICT projects that would help women in rural areas. A book published in 2010, Small Grants That Made Big Changes For Women in Agriculture, examines the implementation of these initiatives and considers how other work carried out by the GenARDIS programme since 2002 has affected rural communities.

The publication relates how women in Benin have used ICTs to learn methods to preserve fish, and how they have used cell phones to discover new markets in neighbouring countries. Another project delivered agricultural information on cell phones to women in Cameroon who live in areas where there is no internet access. One chapter looks back at lessons learned, and reveals that many women still do not receive sufficient support from their husbands and family to become involved in new ICT initiatives, while lack of infrastructure also remains a limiting factor in many communications projects.

➜ To download the full book visit: http://goo.gl/yF7Aw

Technology in disaster relief

The emergency operation that followed the 2010 earthquake in Haiti was the first time a major disaster relief effort made large-scale use of social media and cell phone technology. Humanitarian aid teams arrived in the country desperate for information that would help them plan their response and allow them to deliver medicines and supplies as effectively as possible. On hearing of their need, hundreds of volunteers around the world began analysing the latest satellite images of the area, and used the resulting data to provide updated maps using OpenStreetMap. The emergency response teams could quickly see which streets were still open for transport, allowing them to plan the best routes through the capital city, Port-au-Prince.

But not all instances of technology use were as successful. The United Nations Foundation and Vodafone Foundation Technology Partnership, in collaboration with the UN Office for the Coordination of Humanitarian Affairs (OCHA), therefore, commissioned a team from the Harvard Humanitarian Initiative to analyse the various initiatives used in the aftermath of the earthquake. The aim was to look at what lessons could be learned to ensure better cooperation in future emergency situations between traditional aid organisations and the newer, emerging volunteer and technical communities, such as OpenStreetMap and Ushahidi. The report recognises the benefits that ICTs can bring to disaster relief operations, particularly the speed at which data can now be analysed. The authors recommend five main methods of addressing the challenges, including the development of training sessions where the two groups can safely practice methods for closer collaboration.

➜ Disaster Relief 2.0, The Future of Information Sharing in Humanitarian Emergencies, at: http://goo.gl/cme5g

222 million tons of food wasted every year in industrialised countries, while net food production in sub-Saharan Africa is 230 million tons. Source: FAO

24.5 terabytes, the expected capacity of submarine cables providing internet services to Africa by the end of 2011, according to Africa Analysis

24.7 million Facebook users in Africa with the amount doubling every 7 months in some countries; Balancing Act http://goo.gl/7TmiU

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I look at technology related sites like ICT Update, Computer Hint, and Startups at least once a week.(www.computerhint.com and www.startupbizhub.com)

I find Scribd.com a useful site for finding and reading books. And I use Slideshare.net to upload my presentations, but it's also good for catching up with what's been posted by others. I've recently been trying Google Chrome to browse the web, but usually I use Mozilla Firefox and bookmark any sites using the toolbar function. I also subscribe to several RSS feeds to help me keep up to date with news stories.

learning opportunities on topics and in areas that are interesting to me. For instance, I regularly contribute to groups on Facebook, particularly to one on the use of ICT for rural development. The group is made up of people and professionals like me, many of whom live elsewhere in the world but who are also working with technology to improve rural economies. These groups are great places for sharing ideas and swapping stories and experiences.

Technology takes care of business

Websites

As an entrepreneur and a technology enthusiast, I mainly visit the web for information and entertainment. There are certain sites that I check every day. For business information and advice, I visit the websites of the Harvard Business Review and Entrepreneur Magazine. These and other sites are really helpful for learning new skills I can use in my work and management tips that I can apply to my business.
(http://hbr.org and www.entrepreneur.com)

Next are the news sites – the BBC first, then the New York Times. (www.bbc.co.uk and www.nytimes.com)

Then there are sites that I check frequently, though perhaps not every day, such as the microblogging website, Twitter, and the social networking sites LinkedIn and Facebook, in that order. These help me to keep in touch with colleagues who have similar business interests.

MICHAEL AUSTEN / ALAMY

Web tools

Google Maps is one of my favourite web tools. I am currently working to incorporate it into a management information system, called Coopworks, that my colleagues and I have developed for coffee farmers. When farmers query the system, the software automatically will detect their location and deliver advice directly from the nearest research station or provide tips, such as the best type of coffee to grow, depending on their local situation. The same principle could be applied to emergency calls, detecting the exact coordinates of someone who is lost or in difficulty.
(http://apf-kenya.ning.com/profiles/blogs/coffee-coopworks-software)

I use Skype a lot to call friends and relatives, especially if they are outside the country. (www.skype.com)

Google Docs offers a huge depository for storing backups of documents free of charge. I use it to store copies of transcripts, my academic certificates, and even my passport – all of which can be easily accessed from practically anywhere whenever I need them.

Social networking

I have accounts with Twitter, (@ropkiplagat) and on Facebook and LinkedIn. The most useful thing about social networking is that it has enabled me get in touch with old friends, schoolmates and, most importantly, business associates. The groups on these sites offer more

Programs

As a web developer, I use Drupal, and open source software, to build new websites and to develop applications using the Perl and Python programming languages.
(http://drupal.net, www.perl.org, www.python.org)

My colleagues and I choose these technologies because we are developing programs aimed at helping people living in rural areas whose disposable income is often low and who cannot afford the high cost of computer programs that require licensing. This can often be one of the major costs involved in using ICTs, and leaves less money available for other essentials such as training and hardware. Using open source software removes this cost and can make technology affordable for projects with low budgets.

Mobile

My phone use is roughly divided between 90% calls, and 5% internet. I prefer to call my business clients and associates, and send text messages to family, friends, and closer business contacts. I use the internet on my cell phone to check e-mails and news sites.

I often use the Google Maps application. I travel a lot for my work, and regularly visit remote areas that I have never been to before. I can use the Maps app to estimate the distance and the time it will take to get there. There have been occasions when I have had to deliver an urgent quotation directly to a client. I checked the app to determine the distance and the type of terrain, and managed to arrive on time, and win the contract! Time really can be precious when you are self-employed. ◀

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